



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/765,806	01/19/2001	Robert L. Gerlach	F064	9171

25784 7590 01/13/2003

MICHAEL O. SCHEINBERG  
P.O. BOX 164140  
AUSTIN, TX 78716-4140

EXAMINER

EL-SHAMMAA, MARY A

ART UNIT PAPER NUMBER

2881

DATE MAILED: 01/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/765,806

Applicant(s)

GERLACH ET AL.

Examiner

Mary A. El-Shammaa

Art Unit

2881

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 January 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4-6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-7, 19-27, 29, and 30 are rejected under 35 U.S.C. 102(a) as being anticipated by Okino et al. (6,277,542).

Regarding claims 1-5, 7, 20, 21, and 30, Okino et al. discloses in Fig. 4 a method of using a focused ion beam comprising an ion source (101) that forms ions into a non-Gaussian shaped ion beam and are directed towards a target (114), wherein the ion beam at the target plane has an average current density lower than that of a similar beam without shaping (Col. 4, Lines 61-64, Col. 5, Lines 12-16, Col. 6, Lines 1-4). Further, the ions in the beam induce a reaction of the working material to deposit or remove material from the target (Col. 6, Lines 40-47). The ions are passed through a beam-shaping aperture (106) and form an image of the aperture on the target, said aperture can have a straight edge positioned in the path of the ions near the beam center (Col. 6, Lines 15-16, 31-33, 55-65). The ion beam can be under focused to produce uniform current density at the target surface (Col. 4, Lines 61-67, Col. 5, Lines 1-7).

Regarding claim 6, Okino et al. discloses etching or depositing and repeating a pattern corresponding to the ion beam onto the target (Col. 9, Lines 10-15, 31-34).

Regarding claims 19 and 22, Okino et al. discloses a method and apparatus (See Figure 4) for producing a shaped ion beam comprising an ion source (101), first and second lenses (112, 113) wherein the first lens can be configured to form an image of the ion source at the second lens plane by placing the target (114) at the same plane as the second lens, and an aperture positioned between the first and second lens (Col. 6, Lines 55-65, Col. 8, Lines 51-54).

Regarding claims 23- 25, 27, and 29, Okino et al. discloses a method and apparatus for producing a shaped ion beam comprising an ion source and a beam shaping aperture, as applied to claims 1 and 2 above, said aperture being rectangular in shape or having any other shape, including a knife edge, and focusing the ion beam on a plane beyond the target so that the ion beam has uniform current density at the target plane (Col. 3, Lines 25-33, Col. 4, Lines 55-67, Col. 5, Lines 1-7, Col. 6, Lines 15-16).

Regarding claim 26, Okino et al. discloses the ion beam having a current density at the target plane that is reduced from that of the corresponding unshaped beam (Col. 7, Lines 46-61).

Claims 9, 11-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamamura et al. (6,303,932).

Regarding claims 9 and 12, Hamamura et al. discloses in Figure 1, a focused ion beam system comprising a vacuum system containing an ion beam column (1) in the vacuum, said ion beam including high voltage beam blanking and scanning electrodes and an aperture and lens, a secondary electron or ion detection and imaging system (9), a gas injection system (28), and a controller for controlling the shaped ion beam (91) (Col. 5, Lines 25-50, 64-67, Col. 6, Lines 1-30, Col. 7, Lines 31-36).

Regarding claim 11, Hamamura et al. discloses a current density profile that exhibits at least one geometric feature having a high edge resolution (Col. 14, Lines 45-46 and 60-63).

Regarding claim 13, Hamamura et al. discloses said gas injection system including a precursor gas for depositing a conductive or insulating material (Col. 14, Lines 36-42).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Okino et al. in view of Hamamura et al.

Regarding claim 8, Okino et al. does not disclose the direction of a precursor gas and deposition of a conductive or insulating material. Hamamura et al. discloses a precursor gas and the deposition of a conductive or insulating material (Col. 7, Lines 54-58 and Col. 14, Lines 36-42). It would have been obvious to one having ordinary skill in the art at the time the invention was made to direct a precursor gas onto the target as taught by Hamamura et al. so as to create a conductive or insulating region on the target.

Claims 10, 14, 15, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamura et al. in view of Okino et al.

Regarding claims 10, 14, 15, 17, and 18, Hamamura et al. does not disclose the low current density being uniform in the target plane and a straight edge being positioned in the beam path. Furthermore, Hamamura et al. does not disclose the ion beam column including an aperture with one or more straight edges, wherein the beam column focuses the ion beam beyond the target plane to provide a shaped ion beam of uniform current density at the target. Okino et al. discloses a focused ion beam system wherein the low current density is uniform in the target plane and a straight edge is positioned in the beam path and the ion beam column focuses the ion beam beyond the target plane, providing a shaped ion beam having uniform current density at the target, additionally, the aperture having one or more straight edges (Col. 3, Lines 25-33, Col. 4, Lines 57-64, Col. 5, Lines 1-7, Col. 6, Lines 15-21, Col. 8, Lines 18-27). It would have been obvious to one having ordinary skill in the art at the time the invention to modify the method and system of Hamamura et al. with the teachings of Okino et al. because the teachings of Okino et al. results in a system having a higher resolution.

Claims 16 and 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Hamamura et al. in view of Okino et al., and further in view of Roussin (4,724,359).

Regarding claims 16 and 28, Okino et al. and Hamamura et al. do not disclose the ion beam column having limited chromatic aberrations. Roussin discloses limiting chromatic aberrations (Col. 6, Lines 8-15). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the beam column taught by Okino et al. with the teachings of limited aberrations as taught by Roussin because limiting the aberrations greatly reduces the amount of distortion.

### *Conclusion*


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. (6,414,307), (6,274,877), (6,128,134), (6,042,738), (5,524,018).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary A. El-Shammaa whose telephone number is 703.308.0851. The examiner can normally be reached on M-F(8:30am-5:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on 703.308.4116. The fax phone numbers for the organization where this application or proceeding is assigned are 703.872.9318 for regular communications and 703.872.9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703.872.9317.

mae  
December 24, 2002

  
JOHN R. LEE  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800